

2/p

PROGRESS REPORT NO. 2,

~~COVERING THE PERIOD~~

FROM AUGUST 1-12 AUGUST 31, 1963

FOR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ON

[2]

(NASA CONTRACT NASw-766)  
(NASA CR-52514)

Development of Launch Vehicle  
Optimization Systems utilizing  
the System Optimization and  
Review Technique

Open [1963] 4 p Open

N65 16982

(ACCESSION NUMBER)

4

(PAGES)

CR 52514

(NASA CR OR TMX OR AD NUMBER)

(THRU)

1

(CODE)

11

(CATEGORY)

GPO PRICE \$ \_\_\_\_\_

OTS PRICE(S) \$ \_\_\_\_\_

5120001

init copy

(2)

LEAR SIEGLER, INC.  
Instrument Division

4047 Eastern Avenue  
Grand Rapids 8, Michigan

Hard copy (HC) 1.00

Microfiche (MF) .50

## NASA LVO-SORT AUGUST PROGRESS REPORT

During this reporting period work was conducted on tasks 1, 3, 4 and 5 delineated in the LVO-SORT Contract NASw-766 statement of work. A brief report of work accomplished against the contractual tasks follows:

Task 1: Define a generalized launch system in terms of the interconnected subsystems.

This task was assigned by subcontract to Space Systems Center of LSI. Work on this task was initiated on 1 August. It is estimated that this work should be completed during the September reporting period.

Task 2: Select a subsystem which is amenable to analysis by F. H. Westervelt technique. This selection will be subject to approval by NASA Project Monitor.

This task was completed during the preceeding reporting period. The guidance subsystem was selected and this selection approved by the NASA Project Monitor. The choice of the guidance subsystem selection under this task was predicated on two basic objectives on the Phase 1 effort. These objectives were as follows:

1. To provide a representative problem of reasonable magnitude for preliminary evaluation of Dr. Westervelt's simulator technique.
2. To ascertain the manner in which this type of subsystem should be described when used in analyzing the launch vehicle complex.

Initially three guidance configurations were chosen. These configurations were a stable platform guidance system, a rate strapdown guidance system and a position strapdown guidance system. A review of the magnitude of using three guidance configurations in the time span remaining on Phase 1 indicated that one of these configurations should be singled out for detailed study. The accessibility of requisite information resulted in the choice of the stable platform guidance system.

Task 3: Collect the data required to define the selected subsystem with Dr. Westervelt's technique.

This task was completed during this reporting period.



Task 4: Define the subsystem behavior in terms of such physical parameters and characteristics as cost, reliability, weight, performance, etc.

Work on this task is proceeding satisfactorily. It is estimated that it will take the remainder of Phase 1 to complete. The work on this task is being approached by a parallel effort. The branches of this parallel effort being as follows:

1. Simulator simulation of the guidance subsystem.

This encompasses system definition, element descriptors, source program and necessary subroutines.

2. Independent simulation of the guidance subsystem.

This consists of separate analyses of performance, reliability and cost with the information resulting from these analyses analyzed with the regression program.

Task 5: Refine existing computer techniques and develop new methods as required to adapt Dr. Westervelt's technique to NASA launch vehicles and propulsion program problems.

This task has been assigned by subcontract to the University of Michigan under the direction of Dr. Westervelt. This effort at the present time has four basic parts as follows:

1. Simulator

The simulator technique is currently being programmed for the 7090 IBM computer. It is expected that this program will be completed and initial checkout begun during the September reporting period.

2. Stepwise Regression With Simple Learning

This program is complete and in the process of final checkout. It should be ready for use during the September reporting period.

### 3. Optimization

The optimization technique is currently being programmed for the 7090 IBM computer. It is expected that approximately two months will be required to complete the programming and begin initial checkout.

### 4. Nonlinear Estimation

This program is not underway at present. Programming on this should begin during the September reporting period.

Task 6: Process the available data and establish the areas of strength and weaknesses in order to extend the technique for eventual analysis of the entire launch vehicle complex.

The responsibility for this task is to be shared between Instrument Division and the University of Michigan. Initialization of work against this task requires partial to full completion of tasks 2 through 5. Through this reporting period only minimal work has been accomplished against this task.